

List of Claims

1. (currently amended) A fuel injector comprising:
 - a high-pressure fuel supply line;
 - a fuel cavity;
 - a check control cavity;
 - a check valve at least partially disposed in said fuel cavity and being exposed to a fluid pressure force, in said check control cavity;
 - a control valve moveable between a first position, at which said high-pressure fuel supply line is fluidly connected to said fuel cavity but not fluidly connected to said check control cavity, and a second position, at which said fuel cavity is fluidly connected to said check control cavity;
 - a low pressure drain line connected to said check control cavity;
 - a valve member at least partially disposed within said control valve; and
 - an electrical actuator, being adapted to directly move said valve member.

2. (currently amended) ~~The fuel injector of claim 1 wherein~~ A fuel injector comprising:
 - a high-pressure fuel supply line;
 - a fuel cavity;
 - a check control cavity;
 - a check valve at least partially disposed in said fuel cavity and being exposed to a fluid pressure force, in said check control cavity;
 - a control valve moveable between a first position, at which said high-pressure fuel supply line is fluidly connected to said fuel cavity, and a second position, at which said fuel cavity is fluidly connected to said check control cavity;
 - a low pressure drain line connected to said check control cavity;
 - a valve member at least partially disposed within said control valve;
 - an electrical actuator, being adapted to directly move said valve member; and
 - said low-pressure drain line is directly connected to said check control cavity via an orifice disposed in a check piston.

3. (previously presented) The fuel injector of claim 1 wherein said control valve has a transition location between said first position and said second position in which said fuel cavity and said check control cavity are fluidly connected to said high-pressure fuel supply line; and

a check control cavity line extending between said control valve and said check control cavity includes an orifice.

4. (currently amended) ~~The fuel injector of claim 1 further including:~~ A fuel injector comprising:

a high-pressure fuel supply line;

a fuel cavity;

a check control cavity;

a check valve at least partially disposed in said fuel cavity and being exposed to a fluid pressure force, in said check control cavity;

a control valve moveable between a first position, at which said high-pressure fuel supply line is fluidly connected to said fuel cavity, and a second position, at which said fuel cavity is fluidly connected to said check control cavity;

a low pressure drain line connected to said check control cavity;

a valve member at least partially disposed within said control valve;

an electrical actuator, being adapted to directly move said valve member; and

a check piston at least partially disposed in said check control cavity, and said low-pressure drain line including an orifice disposed in said check piston.

5. (currently amended) ~~The fuel injector of claim 1 further including:~~ A fuel injector comprising:

a high-pressure fuel supply line;

a fuel cavity;

a check control cavity;

a check valve at least partially disposed in said fuel cavity and being exposed to a fluid pressure force, in said check control cavity;

_____ a control valve moveable between a first position, at which said high-pressure fuel supply line is fluidly connected to said fuel cavity, and a second position, at which said fuel cavity is fluidly connected to said check control cavity;

_____ a low pressure drain line connected to said check control cavity;

_____ a valve member at least partially disposed within said control valve;

_____ an electrical actuator, being adapted to directly move said valve member;

an orifice in said low-pressure drain line; and

a check control cavity line extending between said control valve and said check control cavity.

6. (cancelled)

7. (previously presented) The fuel injector of claim 1 wherein said electrical actuator is a piezo-stack type actuator.

8. (previously presented) The fuel injector of claim 1 wherein said electrical actuator has an armature;

said armature being connected to said valve member.

9. (original) The fuel injector of claim 1 further including:

a check piston having a predetermined diameter at least partially disposed in said check control cavity;

said check valve having a predetermined diameter; and

said predetermined check piston diameter being greater than said predetermined check valve diameter.

10. (previously presented) The fuel injector of claim 5 wherein said orifice is a first orifice; and

check control cavity line includes a second orifice.

11. (previously presented) The fuel injector of claim 10 wherein said first orifice in said low-pressure drain line is smaller than said second orifice in said check control cavity line.

12. (previously presented) A method of operating a fuel injector having a fuel cavity, a check control cavity, and a check valve at least partially, slideably disposed in said fuel cavity and exposable to a pressure force in said check control cavity, comprising:

actuating a control valve; and

fluidly connecting said fuel cavity to said check control cavity; and

stopping fuel injection by said fuel injector at least in part by fluidly connecting said fuel cavity to a low pressure drain line via said check control cavity.

13. (cancelled)

14. (previously presented) A method of operating a fuel injector having a fuel cavity, a check control cavity, a check valve at least partially, slideably disposed in said fuel cavity and exposable to a pressure force in said check control cavity, and a control valve moveable between a first position at which high-pressure fuel flows from a high-pressure fuel source to said fuel cavity and a second position at which said high-pressure fuel source is fluidly blocked from said fuel cavity, comprising:

moving said control valve from said second position to said first position through a transition location;

fluidly connecting said fuel cavity and said check control cavity to said high-pressure fuel source while said control valve is in said transition location;

fluidly connecting said check cavity to a low-pressure drain line via a first orifice;
and

restricting a fluid connection between said high-pressure fuel source and said check control cavity via a second orifice when said control valve is in said transition location.

15. (original) The method of claim 14 further including:

maintaining said fluid connection between said fuel cavity and said high-pressure fuel source and fluidly blocking flow to said check control cavity when said control valve is in said first position.

16. (cancelled)

17. (cancelled)

18. (currently amended) ~~The fuel injector of claim 1 wherein~~ A fuel injector comprising:
_____ a high-pressure fuel supply line;
_____ a fuel cavity;
_____ a check control cavity;
_____ a check valve at least partially disposed in said fuel cavity and being exposed to a fluid pressure force, in said check control cavity;
_____ a control valve moveable between a first position, at which said high-pressure fuel supply line is fluidly connected to said fuel cavity, and a second position, at which said fuel cavity is fluidly connected to said check control cavity;
_____ a low pressure drain line connected to said check control cavity;
_____ a valve member at least partially disposed within said control valve;
_____ an electrical actuator, being adapted to directly move said valve member; and
_____ said fuel cavity is fluidly connected to said low pressure drain via said check control cavity when said control valve is in said second position.

19. (previously presented) The method of claim 12 including a step of restricting flow through the low pressure drain line with a first orifice; and restricting flow in a check control cavity line with a second orifice.

20. (previously presented) The method of claim 14 wherein the moving step is accomplished by moving an armature attached to a valve member of the control valve.

21. (previously presented) The method of claim 14 including a step of stopping fuel injection by said fuel injector at least in part by fluidly connecting said fuel cavity to said low pressure drain via said first and second orifices.